Household Food Consumption Pattern as Indicator of Food Security Level among Jordanian population: Bani Ubaid District

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***Abstract*- Background:** Household expenditure is a useful indicator in food security to determine food consumption patterns and adequate consumption of nutritional requirements. **Objective**: To explore the impact of the level of household's food security in the study area on their food consumption patterns. **Methods:** A cross-sectional study was carried out in the 446 families in Bani Ubaid District in Jordan from October 2022 to January 2023. Data on household food consumption patterns over the previous seven days, household income and expenditure as food security indicator were collected. Results: The findings revealed that the average number of family members is six. The percentage of monthly household's food expenditure was (52.9%), placing them in the category of medium-food insecure households. Moreover, the majority of the participants (55.6%) have met their nutritional needs sufficiently, with an average food consumption pattern for families of (3.63). the highest consumption among families was grain and oils and fat groups (4.3 ± 1.2), and the least one is legumes (2.3 ± 1.2). whereas, The R^2 value is 57.7%, and the value of the (F) test was (604.9, p = 0.001), increasing the possibility of relying on the regression model to show the extent of the influence of household food security on the food consumption pattern. **Conclusion:** In present study it was found that food consumption patterns are a promising indicator and guide for measuring food security and nutritional adequacy.

***Index Terms*-** Food security, consumption pattern, Jordan, Household, food group

Introduction

Food security is defined as all people having access to nutritious, adequate, safe, and socially acceptable foods at all times in order to live an active and healthy life (World Bank, 1986; Life Science Research Office, 1990). Food accessibility, adequacy, security, and sustainability are all aspects of household food security (Gittlesohn et al., 1998; Maxwell & Frakenberger, 1992). There are numerous direct and indirect measures of food security, including social and

economic indicators, food consumption, anthropometrics, and strategies for dealing with food insecurity, and a single indicator may not be sufficient to reveal the complexities of food security. (Maxwell et al., 1999). It has been established that food insecurity is a form of deprivation that can affect physical, mental, and social well-being. Family members with a low level of food security or food insecurity, particularly children, are likely to suffer from poor growth, poor learning ability, and a variety of psychological and social problems (Alaimo at el., 2001; Alaimo at el., 2002; Kaiser et el., 2002; Oh and Hong, 2003; Reid, 2000). Food insecurity is influenced by factors such as educational level, household income, and household food access (Ben Yazza, 2018).

A household's food access is determined by a number of factors, including household income and food availability (Kaiser et al., 2002). Moreover, dietary pattern is determined by household food availability (Oh and Hong, 2003). Dietary patterns are the quantities, proportions, variety, and frequency of all food and beverages consumed on a regular basis (Buzby et al., 2014) The approach of using dietary patterns as an assessment tool to determine diet quality provides a meaningful bridge towards disseminating messages aimed at promoting high-quality diets (Moeller, 2007) that are associated with overall better health and a lower risk of chronic disease. Food consumption patterns have direct and negative consequences for food security (Faber et al., 2009). Food-insecure households consume less diversely than food-secure households. Furthermore, families with low food consumption patterns were more vulnerable to food shortages than families with high food consumption patterns. As a result, food consumption patterns are a promising indicator and guide for measuring and using food security in studies and surveys (Tomayko, 2017).

In various countries around the world, studies on household food security and dietary consumption patterns are important. In the light of the frequency of political crises affecting global food security, such as the Russia-Ukraine war and climate change, the correlation between household food security and food consumption patterns has not been studied at the regional or local levels. Moreover, lack of clarity of the relationship between the food consumption patterns and the level of food security of Jordanian families, due to the limited studies that have been carried out to examine this relationship, as the data of the Department of Statistics indicate that 0.5% of Jordanian families are food insecure and what 5.7% of Jordanian families are exposed to a state of food insecurity (Department of Statistics, 2016). Household food security level raises the problem that may be related to a disturbance in the food consumption patterns of these Jordanian families in the study area (northern Jordan). Therefore the objective of our study is to explore the impact of the level of food security of households in the study area on their food consumption patterns.

Materials and Methods:

Study design and setting

A cross-sectional study was carried out in the Bani Ubaid District from October 2022 to January 2023. Bani Ubaid district is considered one of the districts of Irbid Governorate, which is located in northern Jordan, 8 kilometers from the governorate's center. The district is distinguished by its strategic location, which connects many governorates and districts. The district has a moderate climate with a high annual rainfall rate of about 420 mm. The district's lands are fertile and suitable for agriculture, particularly grain cultivation (Department of Statistics, 2020).

A total of 446 families were chosen at random from a total of 47,340 families. The sample size was calculated with a 95% level of confidence and a 5% margin of error.
A skilled researcher administered a validated structural questionnaire to the head of the selected household. According to the Department of Statistics (2020), the questionnaires were distributed to families based on the number of families in each region. Data on household sociodemographic, household food consumption patterns over the previous seven days, and household income and expenditure as food security indicator were collected.

Food security indicators

Household income and expenditure survey:

Household expenditure score (HES) assess the amount of food purchased by households. This method involves interviewing respondents in their homes, and the respondents reveal how much money they spend on food and other necessities at various points in time (WFP, 2021; Ukegbu et el., 2019; Ahmad et el., 2021). The household expenditure score was calculated using the formula

Household expenditure score = (the amount of income spent on food ÷ total income) x 100

The level of household's food security based on their expenditure was determined based on World Food Program (WFP, 2021).

Household food consumption patterns: Food consumption score (FCS) is used to determine the frequency, dietary diversity, and nutritional importance of different food groups consumed by household members in the seven days preceding the survey (WFP, 2008). The consumption of food items by families was determined in 11 food groups using a standard food frequency questionnaire (FFQ) (Barzegar et al., 2019). The FCS was calculated by adding the frequency of food consumption in each group, multiplying by food group weight, and then adding all the weighed groups. (WFP, 2008) The FCS threshold was determined based on the frequency of food group consumption and consumption behavior in the country. According to WFP (2006), a score of 0-21 indicated an inadequate nutritional requirement, a score of 21.5-35 indicated a borderline, and a score of more than 35 indicated adequate and meets nutritional requirements (WFP, 2006).

Estimating the effect of household food security on their food consumption pattern:

To estimate the effect of the level of food security on the food consumption pattern of households, a simple regression equation was used. In the model, the food consumption pattern represents by the frequency of consumption of food groups as dependent variable, while the food consumption score which represents the level of food security as independent variable. The form represents the following standard form:

$Y = \beta_0 + \beta_1 X + \varepsilon$

Where: Y = food consumption pattern (frequency of eating food groups / dependent variable).

X = food consumption score (level of food security (independent variable).

β_0 = regression constant (frequency of eating food groups without the influence of the independent variable

β_1 = the amount of change in the frequency of eating food groups when the sign of food consumption changes by one sign.

ε = random error.

Statistical analysis: Statistical analyzes were conducted using the Analytical Statistical System for Social Research, version 25, Statistical Package for Social Sciences - (SPSS). The demographic characteristics of the study sample were analyzed using descriptive statistics. A simple regression coefficient was used to estimate the relationship between the effect of the food consumption index and the food consumption patterns of households in the study area.

The level of relative importance is determined participants response to the five-point Likert scale of each paragraph, which were determined according to the following equation:

Category length = upper limit of the alternative - lower limit of the alternative / number of levels.

The category length is 1.33 and the level of relative importance is as follows: low relative importance if the arithmetic mean value is less than 2.33, medium relative importance if the arithmetic mean value is between 2.33 and less than 3.66, and high relative importance if the arithmetic mean value is between 3.66– 5. Simple regression coefficient: to estimate the relationship between the effects of the level of food security represented by the food consumption index on the food consumption patterns of households in the study area.

Results

A total of 446 Jordanian families from the Bani Ubaid District participated in this study, and the average age of the head of the household in the study population was 44.5 years, according to the results shown in Table 1. The findings revealed that the head of the household had the highest educational attainment (45.3%), while the illiterate had the lowest (3.6%). The average number of family members is six. According to the findings, the average monthly income of Bani Ubaid district families was 674.22 Jordanian dinars.

Table 2. Showed that the percentage of a household's food expenditure from monthly income was (52.9%), placing it in the category of medium-food insecure households. It was discovered that (57.6%) of families spend their monthly income on food and fall into the category of food-secure families, while (13.7%) of families are food-insecure, and (8.3%) of families are extremely food insecure. However, in Bani Ubaid District, the percentage of families experiencing food insecurity reached (22%).

Table 1. Sociodemographic characteristics of the household

Variables	N	%
Age	44.5 ± 10.4	
Educational level of the head of the household		
Illiterate	16	3.6%
Primary school	61	13.7%
Secondary school	167	37.4%
Collage/ university	202	45.3%
Number of family members	6.1 ± 2.2	
1-5	170	38.1%
6-10	268	60.1%
≥ 11	8	1.8%
Average family income	674.2 ± 441	

Data are presented as percentage, mean ± SD

Table 2. Household food expenditure as a percentage of monthly income

	mean ± SD	**n (%)**	**Spending status**	**Indicator (% of income spent on food)**	**Families' food security level**
Household food expenditure	52.9 ± 15.6	37 (8.3%)	very high	≥ 76%	The family is extremely food insecure
		61 (13.7%)	High	66% -75%	The family is food insecure
		91 (20.4%)	Middle	51% - 65%	The family has an average level of food security
		257 (57.6%)	Few	< 50%	The family is food secure

Data are presented as mean ± SD

The households were divided into three categories based on the degree of food consumption patterns. The types of food consumption patterns for families in the Bani Ubaid District are shown in Table 3. According to the study's findings, the majority of household participants (55.6%) have met their nutritional needs sufficiently, with an average food consumption pattern for families of (3.63). Furthermore, (9.4%) of the families in the study area do not meet most of their nutritional needs, as opposed to (35.0%) of families who meet their nutritional needs on average.

Table 3. Food consumption patterns for participants families

Food consumption patterns	**Household food consumption level**	**The average range of the answer**	**mean ± SD**	**N (%)**
Insufficient to meet nutritional requirements	low	1.00-2.32	3.63±0.85	42 (9.4%)
Moderate satisfies nutritional requirements	middle	2.33-3.66		156 (35.0%)
Sufficient to meet nutritional requirements	high	3.67-5.00		248 (55.6%)

Data are presented as mean ± SD

The effect of household food security on the food consumption pattern was estimated by the simple regression method. Food consumption pattern in the model represent dependent variable, while the level of food security represented by the food consumption index is independent variable. Figure 1. The R^2 value is 57.7%, which means that whenever the food consumption score increases by

one sign, the food consumption pattern increases by (0.759). The analysis of variance results for the regression model in Figure 1. confirmed the extent to which the model explains the relationship between the variables, as the value of the (F) test was (604.9, p = 0.001), increasing the possibility of relying on the regression model to show the extent of the influence of the dependent variable on the independent variable. The linear form of the regression model was adopted, which is in the following standard form:

$Y=1.15+0.27X$

Y = food consumption pattern (frequency of eating food groups / dependent variable).

X = the level of food security represented by the food consumption index.

Table 4 shows a description of household food consumption patterns based on the relative importance of food group consumption. The results indicate that the level of household food consumption met nutritional needs to a moderate extent. According to the presented results in Table 4, the highest consumption among families in the study area was grain and oils and fat groups (4.3 ± 1.2), followed by salt and additives with a mean of (4.2 ± 1.3), and the least one is legumes (2.3 ± 1.2). Table (4) estimates that the average number of days of consumption of food groups for families in the northern Jordan region is 4 days for cereals, oils, fats, salt, additives, beverages, juices, and vegetables, and 3 days for milk and dairy product groups and fruits, sweets, eggs, and meat of all kinds, while the group of legumes had the lowest average consumption of two days or less during the week.

DISCUSSION

Household food expenditure is one of the food security indicator and as indicator of household well-being (Rachmawati at al., 2021). Households that spend a higher proportion of their income on food will experience food insecurity; when their income falls, the quality or quantity of food will decrease (WFP, 2017). Many factors influence household food consumption patterns, including income, educational level, environment, and price (Rachmawati at al., 2021). In this study, the families are food secure, they spend nearly half of their monthly income on food, and they are moderately satisfies their nutritional requirements. Furthermore, the relationship between monthly income, the educational level, and the percentage of spending on food is inversely. The expenditure behavior of an individual or family changes with a change in the level of income and education, the percentage of income spent on necessary commodities decreases as income increases and the level of education of the head of the family increases, as education helps increase and speed up understanding and follow correct practices to rationalize consumption, which reduces the percentage of spending on food commodities. Also, there is a negative impact of the level of food security on the food consumption pattern of the families. The greater the diversity of the consumption pattern of food groups, the lower the level of food insecurity.

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The findings revealed that consumption of the grains, vegetables, oils, and fats is higher than consumption of milk, dairy products, and fruits, all types of meat, eggs, and legumes. The average consumption of grains, oils, fats, salt, additives, drinks, juices, and vegetables was 4 days, and the consumption of milk, dairy products, fruits, sweets, eggs, and meat was 3 days, with legumes having

the lowest average consumption of two days or less during the week. These results are consistent with

Figure 1. Estimating the effect of the level of household food security on the food consumption pattern

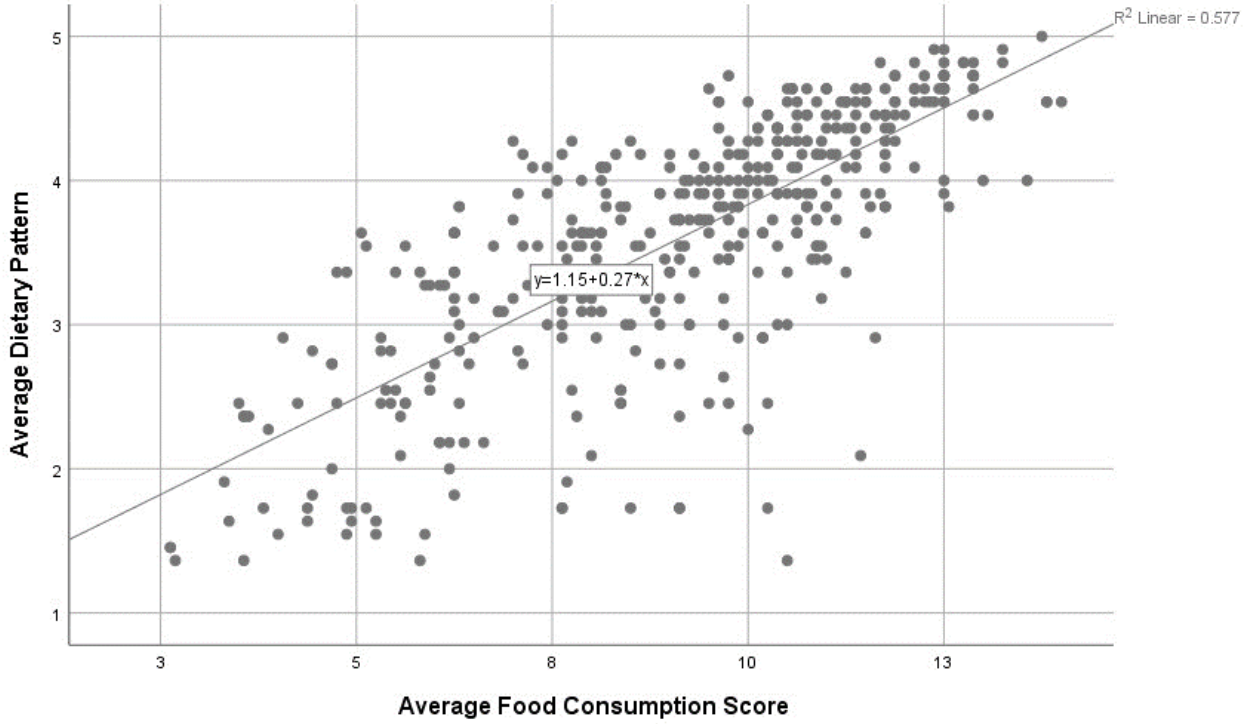

Table 4. Description of household food consumption patterns.

Rank	Food groups	Mean ± SD	Relative importance
1	Grains	4.3 ± 1.2	High
1	Oils and fats	4.3 ± 1.2	High
2	Salt and additives	4.2 ± 1.3	High
3	Drinks and juices	4.1 ± 1.4	High
4	Vegetables	4.0 ± 1.3	High
5	Milk and dairy products	3.6 ± 1.5	Middle
6	Fruits	3.5 ± 1.4	Middle
6	Sweets	3.5 ± 1.5	Middle
7	Eggs	3.1 ± 1.4	Middle
7	Meat of all kinds	3.1 ± 1.4	Middle
8	Legumes	2.3 ± 1.2	Low
total		3.6 ± 0.1	Middle

Data presented as mean ± SD

the findings of (Diehl et al., 2019; Olaimat et al., 2022). Families in the study area are engaged in an agricultural activity which help them achieving food security by increasing their dietary diversity. Moreover, household consumption in agriculture area tend to support food security as the families who engage in agriculture practice tend to consume variety of plant based food like grain, fruit and vegetables. According to the findings of (Alaimo et al., 2008), households that participated in agriculture ate fruits and vegetables 1.4 more times per day and were 3.5 times more likely to eat fruits and vegetables at least 5 times per day than those who did not participate, implying that participating in agriculture has the potential to increase local opportunities to eat healthier (Litt, J.S., 2011). On the other hand increase consumption of grain and oils are cheap source of dietary energy when

compared to same amount of energy from meats, milk and fruits (Troubat et al., 2020). Moreover, study of (Ntwenya et al., 2005) stated that cereal consumption by the majority of households suggests that cereals were abundant in the study areas and most of the households included cooking oils in their diets particularly when they consumed a lot of legumes. In a previous study (Denova-Gutierrez et al., 2010; Arimond et al., 2009), cereal consumption with the addition of cooking oil and a lack of vegetables, fruit, meat, and dairy product consumption was found to be the dominant pattern of consumption in developing countries, implying a shift toward a Western diet. Fruit and vegetables, on the other hand, are important for food diversity because they are high in micronutrients. According to (Johnson et al., 2012), the current study results show adequate consumption of vegetables but insufficient consumption of fruits, which may be attributed to seasonal variation in fruit and vegetable consumption.

Conclusion

Families in the study area are food secure in terms of monthly income spent on food, and the household food consumption pattern is generally described as medium, meeting nutritional needs in a moderate manner. Thus, in order to achieve a balanced consumption pattern, it is necessary to spread food consumption awareness and provide indicative programs in income management to improve the food consumption pattern in order to achieve a balanced diet and reduce spending waste.

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Conflict of interest
The authors declare that they have no conflict of interest.

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